AMENDMENTS TO THE CLAIMS:

The following listing of claims will replace all prior versions, and listings, of claims in the application:

Please cancel claims 1-12:

13. (New) An illumination optical device for illuminating an irradiated plane with light from a light source supplying pulse laser light, comprising:

a diffractive optical element arranged in an optical path between the light source and the irradiated plane, through which a light beam having an energy density of 1 mJ/cm^2/pulse or more passes, wherein

an optical material forming the diffractive optical element includes an oxide crystal material.

14. (New) The illumination optical device according to claim 13, wherein the diffractive optical element is arranged in an optical path between the light source and the irradiated plane, through which a light beam having an energy density of 100 mJ/cm^2/pulse or more passes.

15. (New) The illumination optical device according to claim 13, wherein the oxide crystal material is one of quartz crystal (SiO_2), barium titanate ($BaTiO_3$), titanium trioxide (TiO_3), magnesium oxide (MgO), and sapphire (Al_2O_3).

16. (New) The illumination optical device according to claim 15, wherein an optic axis of the oxide crystal material is set approximately parallel to an optical axis of the illumination optical device.

17. (New)The illumination optical device according to claim 16, wherein the diffractive optical element has a surface shape formed by dry etching.

18. (New) The illumination optical device according to claim 13, wherein the diffractive optical element transforms an incident light beam into a light beam having a given light intensity distribution.

19. (New) The illumination optical device according to claim 13, further comprising:

an optical integrator for forming a secondary light source in a given shape on an illumination pupil plane based on a light beam through the diffractive optical element.

20. (New) The illumination optical device according to claim 13, wherein an optic axis of the oxide crystal material is set approximately parallel to an optical axis of the illumination optical device.

21. (New) The illumination optical device according to claim 20, wherein

the oxide crystal comprises a plurality of optic axes, and wherein

one of the plurality of optic axes is set approximately parallel to the optical axis of the illumination optical device.

22. (New) A photolithography machine, comprising:

the illumination optical device according to claim 20; and

a projection optical system for projecting and exposing a pattern of a mask arranged on the irradiated plane on a photosensitive substrate.

23. (New) An exposure method, comprising the steps of:

illuminating a mask through the illumination optical device according to claim 20; and

projecting and exposing an image of a pattern formed on the illuminated mask on a photosensitive substrate.

24. (New) A photolithography machine, comprising:

the illumination optical device according to claim 13; and

a projection optical system for projecting and exposing a pattern of a mask arranged on the irradiated plane on a photosensitive substrate.

25. (New) An exposure method, comprising the steps of:

illuminating a mask through the illumination optical device according to claim 13; and

projecting and exposing an image of a pattern formed on the illuminated mask on a photosensitive substrate.

26. (New) An illumination optical device for illuminating an irradiated plane with light from a light source supplying pulse laser light, comprising:

a refractive optical element arranged in an optical path between the light source and the irradiated plane, through which a light beam having an energy density of 1 mJ/cm^2/pulse or more passes, wherein

the refractive optical element has a refraction pattern arranged one-dimensionally or two-dimensionally, and wherein

an optical material forming the refractive optical element includes an oxide crystal material.

27. (New) The illumination optical device according to claim 26, wherein the refractive optical element is arranged in an optical path between the light source and the irradiated plane, through which a light beam having an energy density of 100 mJ/cm^2/pulse or more passes.

28. (New) The illumination optical device according to claim 26, wherein the oxide crystal material is one of quartz crystal (SiO_2), barium titanate ($BaTiO_3$), titanium trioxide (TiO_3), magnesium oxide (MgO), and sapphire (Al_2O_3).

29. (New) The illumination optical device according to claim 28, wherein an optic axis of the oxide crystal material is set approximately parallel to an optical axis of the illumination optical device.

30. (New) The illumination optical device according to claim 26, wherein the refractive optical element transforms an incident light beam into a light beam having a given light intensity distribution.

31. (New) The illumination optical device according to claim 26, further comprising:

an optical integrator for forming a secondary light source in a given shape on an illumination pupil plane based on a light beam through the refractive optical element.

32. (New) The illumination optical device according to claim 26, wherein an optic axis of the oxide crystal material is set approximately parallel to an optical axis of the illumination optical device.

33. (New) The illumination optical device according to claim 32, wherein

the oxide crystal comprises a plurality of optic axes, and wherein

one of the plurality of optic axes is set approximately parallel to the optical axis of the illumination optical device.

34. (New) The illumination optical device according to claim 32, wherein the refractive optical element has a surface shape formed by dry etching.

35. (New) A photolithography machine, comprising:

the illumination optical device according to claim 32; and

a projection optical system for projecting and exposing a pattern of a mask arranged on the irradiated plane on a photosensitive substrate.

36. (New) An exposure method, comprising the steps of:

illuminating a mask through the illumination optical device according to claim 32; and

projecting and exposing an image of a pattern formed on the illuminated mask on a photosensitive substrate.

37. (New) A photolithography machine, comprising:

the illumination optical device according to claim 26; and

a projection optical system for projecting and exposing a pattern of a mask arranged on the irradiated plane on a photosensitive substrate.

38. (New) An exposure method, comprising the steps of:

illuminating a mask through the illumination optical device according to claim 26; and

projecting and exposing an image of a pattern formed on the illuminated mask on a photosensitive substrate.